

## CLAIMS

What is claimed is:

1. A low shock separation joint for attaching a first structure to a second structure, the low shock separation joint comprising:
  - a first member including at least one flange;
  - a second member including at least one flange corresponding to said at least one flange on said first member wherein said first member is elastically flexed to allow said at least one flange of said first member to be aligned to said at least one flange of said second member and wherein said at least one flange of said first and second members mate with one another after said first member is released from flexing to prevent separation of the separation joint under tensile and compressive forces; and
  - an explosive device within the separation joint to decouple said first member from said second member when detonated.
2. The low shock separation joint as recited in claim 1 wherein detonation of said separation joint moves surfaces of said at least one flange of said first member out of contact with surfaces of said at least one flange of said second member.
3. The low shock separation joint as recited in claim 2 further including a thrusting device coupled to said first and second members to accelerate said first and second members away from one another upon decoupling.

4. The low shock separation joint as recited in claim 1 wherein said first member comprises:

a first structural element;

a second structural element; and

a third structural element coupled proximally to a major surface of said first and second structural elements to form an I-beam shape.

5. The low shock separation joint as recited in claim 4 wherein first, second, and third structural elements form a clevis on a structural attachment side of said third structural element for receiving and rigidly attaching to the first structure.

6. The low shock separation joint as recited in claim 5 wherein said first member further includes:

a first holding member extending from said first structural element on a joint side of said third structural element and ending in a support surface;

a second holding member extending from said second structural element on said joint side of said third structural element and ending in a support surface wherein said explosive device is held between said support surfaces of said first and second holding members.

7. The low shock separation joint as recited in claim 6 further including a crushable material on said explosive device such that said support surface of said first and second holding members contact said crushable material and wherein pressure is applied on said crushable material through said first and second holding members thereby preventing movement of said explosive device during normal operation of the separation joint.

8. The low shock separation joint as recited in claim 7 wherein said crushable material comprises an aluminum foam.

9. The low shock separation joint as recited in claim 8 further including a first flange on a distal portion of said first structural element on said joint side of said third structural element and a second flange on a distal portion of said second structural element on said joint side of said third structural element.

10. The low shock separation joint as recited in claim 9 wherein said third structural element includes a thinned region for increasing flexibility of said first member.

11. The low shock separation joint as recited in claim 1 wherein said second member comprises:

a first structural element;

a second structural element; and

a third structural element coupled to a major surface of said first and second structural elements such that said first and second structural elements are substantially parallel to one another, said first structural element including a first flange on a joint side of said third structural element, said second structural element including a second flange on said joint side of said third structural element, and said first, second, and third structural elements form a clevis on a structural attachment side of said third structural element for receiving and rigidly attaching to the second structure.

12. A method of assembling a separation joint comprising the steps of:

spreading structural elements of a first member apart from a quiescent state;

inserting an explosive device between said structural elements;

moving a second member in position to couple with said first member; and

releasing said structural elements of said first member to return to said quiescent state such that surfaces on said first and second members are in intimate contact with each other to prevent separation of the separation joint under compressive and tensile forces.

13. The method of assembling a separation joint as recited in claim 12 further including the steps of:

encasing said explosive device in a crushable material; and

coupling said crushable material to said structural elements of said first member wherein said explosive device when detonated spreads said structural elements such that said surfaces of said first and second members for preventing separation of the separation joint under compressive and tensile forces are not in contact with one another.

14. The method of assembling a separation joint as recited in claim 13 further including a step of applying pressure to said crushable material to hold said crushable material and said explosive device in a fixed position when said structural elements of said first member are released back to said quiescent state.

15. The method of assembling a separation joint as recited in claim 14 further including the steps of:

fastening a first structure to said first member; and  
fastening a second structure to said second member.

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16. A method of reducing shock in a separation joint comprising the steps of:

coupling a first member to a second member such that said first and second members have surfaces in intimate contact with one another that prevent separation of the separation joint under compressive and tensile forces;  
detonating an explosive device to move said surfaces of said first and second members out of contact with one another wherein said first and second members are intact; and  
accelerating said first and second members away from one another passively.

17. The method of reducing shock in a separation joint as recited in claim 16 further including the steps of:

providing said explosive device having an expandable housing of a first volume prior to detonation;  
increasing said expandable housing of said explosive device to a second volume after detonation; and  
using a change in said expandable housing from said first volume to said second volume to apply a force on structural elements of said first member such that said surfaces of said first and second members that prevent separation of the separation joint under compressive and tensile forces are moved out of contact with one another.

18. The method of reducing shock in a separation joint as recited in claim 17 further including a step of damping contact between said explosive device and said first member with a crushable material.

19. The method of reducing shock in a separation joint as recited in claim 18 further including a step of using a spring to provide a force to separate the separation joint.

20. The method of reducing shock in a separation joint as recited in claim 19 further including the steps of bending structural elements of said first member upon detonation of said explosive device.